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# (12) UK Patent Application (19) GB (11) 2 070 485 A

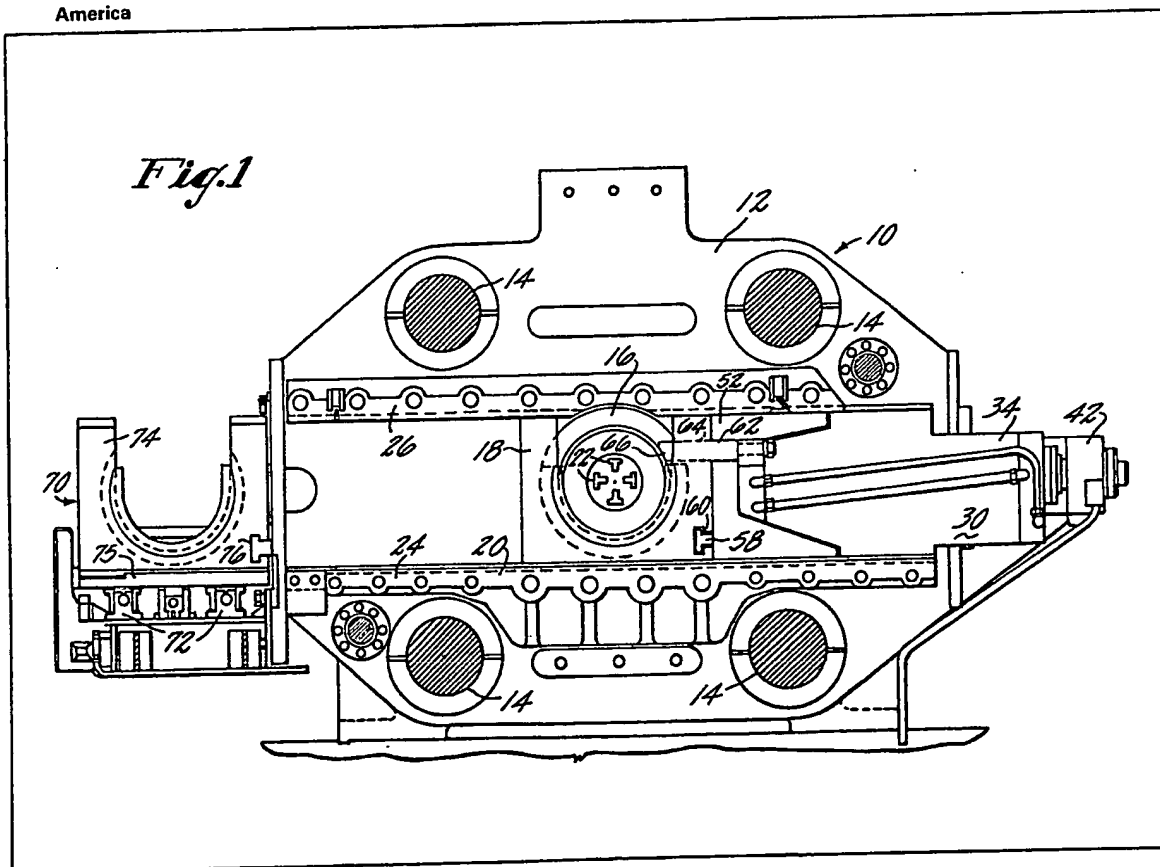
(21) Application No 8106698  
(22) Date of filing 3 Mar 1981  
(30) Priority data  
(31) 127398  
(32) 5 Mar 1980  
(33) United States of America (US)  
(43) Application published 9 Sep 1981  
(51) INT CL<sup>3</sup>  
B21C 23/21  
(52) Domestic classification  
B3P 10B2 12A 15 2 7E 7X  
(56) Documents cited  
GB 1454839  
GB 1416130  
GB 1188677  
GB 1165619  
GB 821827  
GB 753071  
(58) Field of search  
B3P  
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(54) Extrusion press having a die change assembly

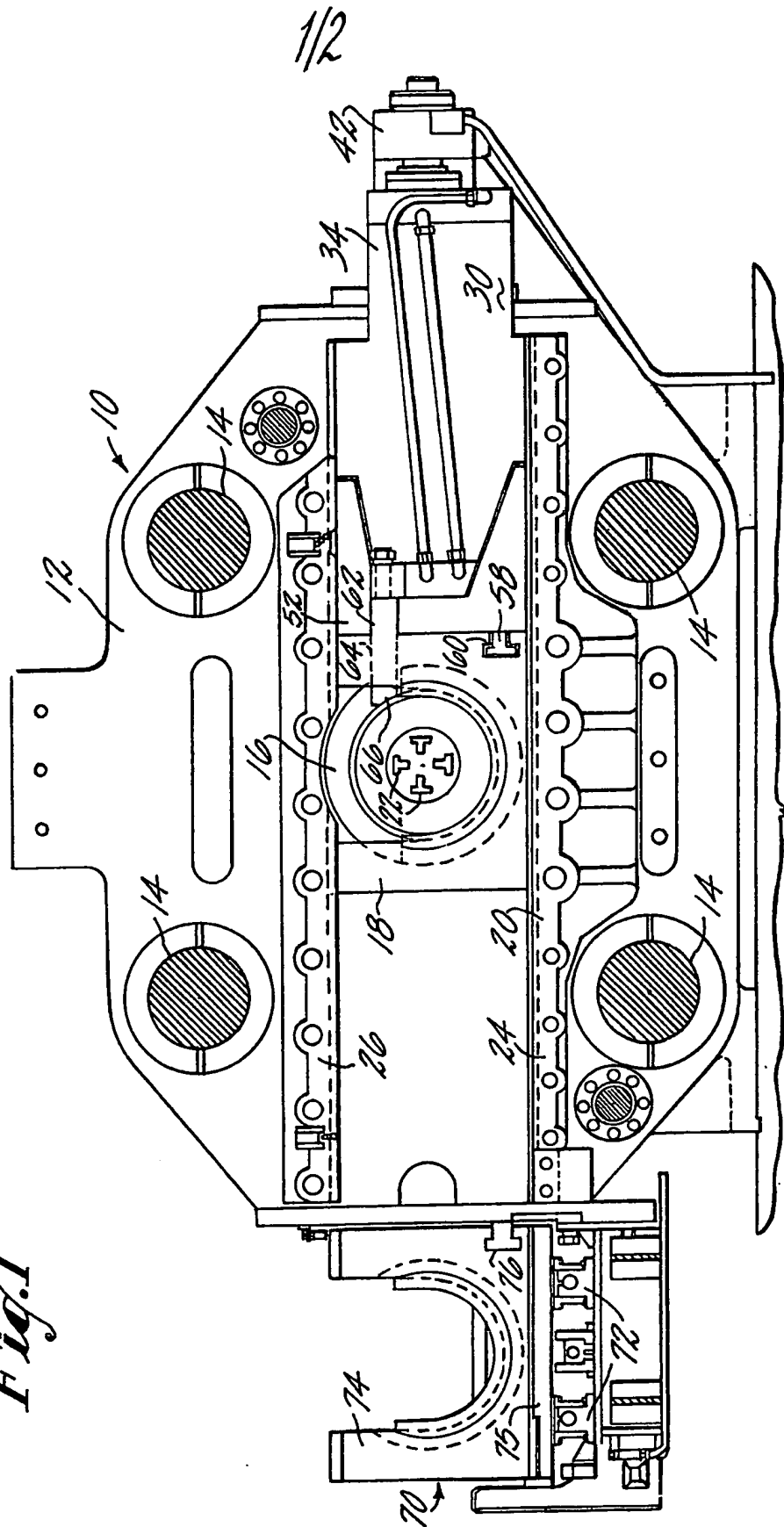
(57) A metal extrusion press having a die change assembly comprises a platen 12 through which material is extruded, a die holder 18 on a support arrangement of the platen, a transfer

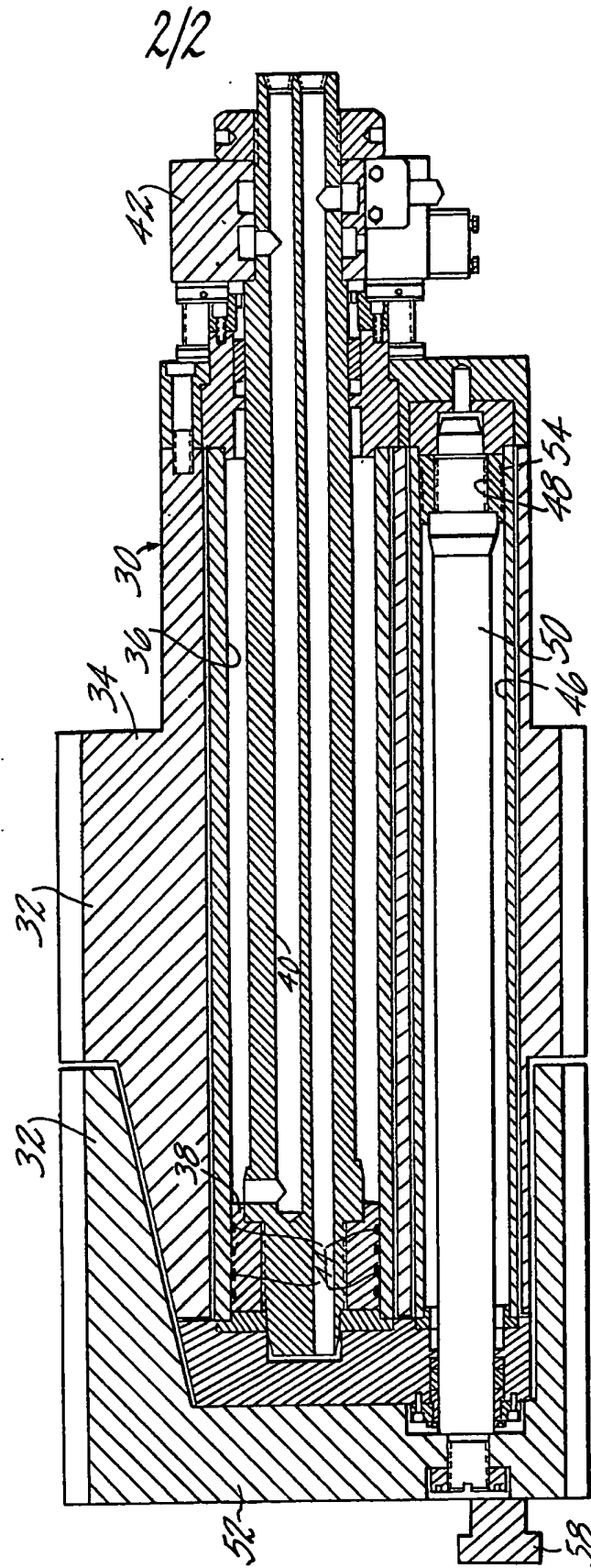
station 70 and a frame assembly, preferably comprising two slide blocks 34, 52 movable on the support arrangement and hydraulic motors both having their cylinders supported by one of the slide blocks. The motors move the assembly along the support arrangements to transfer a die holder to the transfer station (having sheared an extrusion from the die) at which a new holder is attached to the assembly for return to the extrusion position. Preferably there are two motors, one operating between the platen and one block, moving both blocks, and the second between the two blocks. The press is compact and die changing is facilitated as compared with die changing on known presses.



GB 2 070 485 A

Fig. 1



*Fig. 2*

## SPECIFICATION

## Extrusion press having a die change assembly

This invention is concerned with an extrusion press having a die change assembly.

- 5 An extrusion press is utilised to force a heated metal slug or billet through a shaped orifice called a die stack. The die stack is mounted in a carrier which may in turn be supported on a horizontal track or gibs fixed to a massive vertically arranged  
10 platen. The die is aligned with a passageway or egress hole in the plate or platen which provides reinforcement thereagainst, while permitting the metal to be forced and extruded therethrough. It is necessary to change the die from time to time to  
15 permit changes in the extrusion pattern, or to replace a worn die. Several methods have been previously proposed for changing dies. In US Patents 2858017, for example, is disclosed a die shifter having a first cylinder mounted on the side  
20 of the platen adjacent and operating on a die slide assembly, with a second cylinder attached to the platen with a rod which pulls on the bottom of the die slide assembly: both the first and second cylinders are used to shear the extruded article, whereupon the second cylinder is used to shift the  
25 slide slightly from in front of the orifice in the platen to enable an operator to lift the die out through the top of the slide using a crane or the like, and replace it similarly. In US Patents Nos. 3653247 and 4103529 are described extrusion presses having a die slide with empowering means, viz, a single cylinder, for moving the slide, projecting distantly off one side of the press. Yet another extrusion press is described in US Patent  
30 No. 3844151, the press having a die slide arrangement using a chain and sprockets adapted to move a die in conjunction with hydraulic unit, to a transfer station. This type of die shifting mechanism is susceptible to contamination from  
40 metal particles and necessitates constant cleaning and maintenance of the hydraulic unit components.

All of the extrusion presses described in the US patent specifications referred to above thus suffer  
45 from at least one disadvantage.

One of the various objects of the present invention is to provide an improved extrusion press having a die change assembly.

- 50 An extrusion press in accordance with the invention having a die change assembly comprises a platen through which material may be extruded. Suitably the platen is a heavy front platen and is connected by tie rods to a rear platen, a main  
55 press cylinder being mounted between the platens. An extrusion press in accordance with the invention also comprises a die holder mounted on a support arrangement, conveniently a die slide assembly, on the platen. The die holder supports a die in the operation of the press to extrude  
60 material. A press in accordance with the invention also comprises a die transfer station. Preferably the die transfer station comprises a support arrangement, suitably comprising a transfer table slidable on a support track, to which a die holder

- 65 may be transferred from the support arrangement of the plate A and by which a plurality of die holders may be supported and from which transferred to the support arrangement of the platen. Conveniently the transfer station is disposed to one side of the platen.

- 70 A press in accordance with the invention further comprises a frame assembly to which the die holder mounted on the support arrangement of the platen is connected. The frame assembly  
75 comprises a plurality of fluid pressure operated motors by which the frame assembly can be moved along the support arrangement of the platen, whereby the die holder can be transferred from the platen to the transfer station (onto the  
80 transfer table where the transfer station comprises a transfer table) and a further die holder can be transferred from the transfer station to the support arrangement of the platen. Preferably the frame assembly comprises two fluid pressure operated  
85 motors effecting movement of the frame assembly upon actuation of the motors, a first of the motors comprising a piston and cylinder one of which is attached to a portion of the platen and the other of which is attached to the frame assembly:  
90 preferably the cylinder of the first motor is supported by a slide block of the frame assembly and the piston of the first motor is attached to the platen. Preferably the construction and arrangement of the frame assembly is such that  
95 the second motor of the two motors before-mentioned effects final movement of the die holder (carrying a die) to the transfer station. Preferably the first motor effects movement of the die holder carrying a die to shear material being  
100 extruded through the die on a plane between the die and the platen. Suitably movement of the first motor is stopped after shearing is completed: preferably pressurisation of the second motor is effected after the shearing operation is completed.  
105 In a preferred press in accordance with the invention the frame assembly comprises first and second slide blocks slideable on the support arrangement of the platen, the first motor being connected to operate between the platen and the  
110 first slide block, and the second motor being connected to operate between the first and second slide blocks. Conveniently the cylinder of the second motor is supported by the first slide block and the piston thereof is attached to the second slide block.

- 115 A method in accordance with the invention, of operating an extrusion press, in which a preferred press in accordance with the invention is suitably used, comprises operating a first fluid pressure  
120 operated motor to effect movement of a die holder carrying a die to permit shearing of an extrusion therewith, moving a frame assembly connected to the die holder concurrently with initial movement of the die holder and die, and operating a second  
125 fluid pressure operated motor to effect subsequent movement of the die holder and die to a transfer station. Preferably a method in accordance with the invention further comprises transferring the die holder and die onto the transfer station,

disconnecting the die holder from the frame assembly, connecting a second die holder (carrying a second die) to the frame assembly and operating the second motor to move the second die holder and second die closer to an extrusion position: preferably the first motor is then operated to move the frame assembly, including the second motor, and second die holder with the second die to the extrusion position.

There now follows a detailed description, to be read with reference to the accompanying drawings, of an extrusion press embodying the invention and its method of operation. It will be realised that this press and method of operation have been selected for description to illustrate the invention by way of example.

In the accompanying drawings:—

Figure 1 is a view in front elevation showing a die slide assembly of the illustrative extrusion press; and

Figure 2 is a sectional view showing empowering means of the die slide assembly.

The illustrative extrusion press 10 comprises a heavy front platen 12 and a heavy rear platen (not shown) with a main press cylinder (not shown) mounted therebetween, the front and rear platens being connected by an arrangement of four tie rods 14 that take up the thrust of the extrusion operation therebetween. A die stack 16 is supported in a U-shaped die stack holder 18. The die stack holder is movably disposed in a die slide assembly 20. The die stack 16 is of cylindrical configuration, having at least one configured orifice 22 which is in line with an orifice or egress hole extending through the front platen 12. The die slide assembly 20 includes a lower support track 24 and an upper support track 26 both attached to and extending off the rear or inwardly directed face of the front platen 12. An empowering means 30, shown in section in Figure 2, is arranged to slide on the die slide assembly 20. The empowering means 30 comprises a two-piece frame assembly 32 which is movable transversely of the front platen 12. The frame assembly 32 includes a first, primary slide block 34. The primary slide block 34 supportively encloses a pressurisable main cylinder 36 of a first fluid pressure operated motor. A main piston head 38 is slidably arranged within the main cylinder 36 connected to a main piston rod 40 of the first motor. The end of the main piston rod 40 opposite the piston head 38 is securely attached to an arm 42 of the front platen 12. The main piston head 38 has a plurality of piston rings or seals 44 disposed thereon to prevent pressurisable fluid from seeping therepast. The primary slide block 34 also supportively encloses and secures a pressurisable secondary cylinder 46 of a second fluid pressure operated motor. A piston head 48 of the second motor having a plurality of piston rings or seals 54 thereon, is slidably arranged within the secondary cylinder 46, on the distal end of a secondary piston rod 50 to which the head 48 is secured. The end opposite the piston head 48 of the secondary piston rod 50 is connected to a

second, transport slide block 52 of the assembly. The transport slide block 52 and the primary slide block 34 are both arranged in a sliding relationship between the upper and lower support tracks 26, 24, and are in close proximity with one another when both cylinder heads 38 and 48 are fully retracted in their respective cylinders 36, 46.

A "T"-key 58 is secured to the lower edge of the side face of the transport slide block 52. A "T"-slot 60, as shown in Figure 1, is disposed in the lower portion of one side of the die holder 18. A die hold-down finger 62 is attached to the face of the primary slide block 34. The hold-down finger 62 is disposed parallel to and is spaced apart from the face of the transport slide block 52, and extends through a bore 64 in the die holder 18, permitting it to provide hold-down support to the die stack 16 when a shear blade (not shown) is lifted from alongside the die stack 16. The projecting end of the hold-down finger 62 has a curvilinear or angular surface 66 thereon to contact the periphery of the die ring of the die stack 16 thereadjacent.

A die transfer station 70 is disposed at the opposite side of the front platen 12 to the arm 42. The die transfer station 70 comprises a lower support track 72 arranged perpendicular to the die slide assembly 20. A transfer table 75 is slidably mounted on the support track 72, at the level of the die slide assembly 20, which assembly 20 intersects the lower support track 72 at roughly its mid-point. The transfer table 75 has a second U-shaped die stack holder 74 slidably arranged thereon, and includes a die holder shuttle assembly, for example pressurised cylinders (not shown), for moving the transfer table 75 with one of the die holders 18, 74 thereon. The second die holder 74 has a "T"-slot 76 near the bottom on one side thereof (nearest to the empowering means 30).

In the operation of the illustrative extrusion press 10, the main press cylinder (not shown) forces a ram (not shown) to push a billet or slug of material to be extruded through the configured orifice 22 in the die stack 16. The forces generated in the die stack 16 are directed through the die stack holder 18 and the massive front platen 12. The tie rods 14, which are secured to a frame supporting the ram and to the rear platen (not shown) absorb the stresses generated in the extrusion press 10. The tail end of extruded billet may be cut off by a vertically arranged shear (not shown) which shear is disposed above the die stack 16 adjacent the middle of the platen 12. When the vertically arranged shear is lifted, there is a drag between it and the face of die stack 16 which tends to lift the die stack 16 in the die stack holder 18. The die hold-down finger 62 prevents vertical movement of the die stack 16 during this portion of the operation.

When a die is to be changed, fluid, viz. hydraulic fluid, under pressure from a suitable fluid pressure source (not shown), is delivered to the proximal end of the main piston shaft 40 to operate the first motor causing the entire frame assembly 32 to

traverse (leftwardly viewing Figure 1) across the front platen 12 along the die slide assembly 20. Any extrusion remaining within the die orifice 22 and the coaxial opening in the front platen is sheared off at the plane therebetween. Fluid under pressure is delivered from the fluid pressure source (not shown), through proper means, against the secondary piston head 48 within the secondary cylinder 46, either during pressurisation of the main cylinder 36, or after that occurrence, to operate the second motor and thus effect movement of the secondary piston rod 50 out of the primary slide block 34, to cause continued transverse movement (leftwardly viewing Figure 1) of the transport slide block 52, the die stack holder 18 thereattached and die stack 16 carried thereby. The die hold-down finger 62 is retracted from its position adjacent the die periphery and is withdrawn through the bore 64 in the die stack holder 18 as the transport slide block 52 is separated from its position adjacent the primary slide block 34. The die stack 16 and the die stack holder 18 are transferred onto the transfer table 75 mounted on the support track 72 on the side of the platen 12.

The transfer table 75 is then moved by a pressurisable piston and cylinder unit (not shown) along the track 72 away from its association with the transport slide block 52, thus disengaging the die stack holder 18 therefrom by sliding the "T"-slot 60 away from its position enclosing the "T"-key 58, permitting subsequent servicing of the disengaged die stack 18. The new die holder 74, with whatever die may be arranged therewith (none being shown) may be attached to the transport slide block 52 by slidably mating the "T"-slot 76 in the new die holder 74 with the "T"-key 58. Operating the first and second motors to retract the secondary and primary piston rods 50 and 40 within their respective cylinders effects displacement of the new die holder 74 and whatever die is associated therewith to the extrusion position adjacent the front platen 12.

The illustrative extrusion press has a die transfer system which is compact and unobtrusive, eliminating excessive projection of pressurisable cylinders from the sides of the platen, and which permits a relatively easily maintainable and efficient die shearing operation relatively free from the contamination and size problems associated with prior art extrusion press machines.

#### CLAIMS

1. An extrusion press having a die change assembly, comprising a platen through which material may be extruded, a die holder mounted on a support arrangement on the platen, a die transfer station, and a frame assembly to which the die holder is connected and comprising a plurality of fluid pressure operated motors by which the frame assembly can be moved along the support arrangement whereby a die holder can be transferred from the platen to the transfer station and vice versa.

2. An extrusion press according to claim 1 comprising a first fluid pressure operated motor comprising a piston and cylinder one of which is attached to a portion of the platen and the other of which is attached to the frame assembly, and a second fluid pressure operated motor, the motors effecting movement of the frame assembly upon actuation of the motors.

3. An extrusion press according to claim 2 wherein the construction and arrangement is such that the second fluid pressure operated motor effects movement between the die holder and the first motor.

4. An extrusion press according to claim 3, wherein the second motor effects final movement of the die and die holder to the die transfer station.

5. An extrusion press according to any one of claims 2 to 4 wherein the first motor effects movement of the die holder carrying the die to shear material being extruded therethrough on a plane between the die and the platen.

6. An extrusion press according to claim 5, wherein movement of the first motor is stopped after shearing of the extruded material is completed.

7. An extrusion press according to either one of claims 5 and 6 wherein pressurisation of the second motor is effected after the shearing operation is completed.

8. An extrusion press according to any one of claims 2 to 7 wherein the frame assembly comprises first and second slide blocks, the first motor being connected to operate between the platen and the first slide block and the second motor being connected to operate between the first and second slide blocks.

9. An extrusion press according to any one of the preceding claims wherein the die transfer station comprises a support arrangement by which a plurality of dies and die holders are supported and from which a die and holder may be transferred to the support arrangement of the platen by connection with the frame assembly.

10. An extrusion press having a die change assembly constructed arranged and adapted to operate substantially as hereinbefore described with reference to the accompanying drawings.

11. A method of operating an extrusion press, comprising operating a first fluid pressure operated motor to effect movement of a die and die holder to permit shearing of an extrusion therewith, moving a frame assembly concurrently with initial movement of the die and die holder, and operating a second fluid pressure operated motor to effect subsequent movement of the die and the die holder to a die transfer station.

12. A method of operating an extrusion press according to claim 11 comprising transferring the die and die holder onto the transfer station, disconnecting the die and die holder from the frame assembly, connecting a second die and die holder to the frame assembly and operating the second motor to move the second die and die holder closer to an extrusion position.

13. A method of operating an extrusion press

according to claim 12 comprising operating the first motor to move the frame assembly, the second motor and the second die and die holder to the extrusion position.

5 14. A method according to any one of claims 11 to 13 in which is used a press according to any one of claims 1 to 10.

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Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1981. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.